Appendix B
Managed Lanes Strategy Paper

2310 Broening Highway
Suite 150
Baltimore MD 21224
410-537-1000
410-537-1090 (fax)
410-355-7024 (TTY)
1-866-713-1596

e-mail: mdta@
mdtransportation
authority.com

www.mdtransportation
authority.com

SECTION 100

SELECTION OF MANAGEMENT STRATEGY

Prepared By:

Maryland Transportation Authority
300 Authority Drive
Baltimore, MD 21222

MAY 2005

TABLE OF CONTENTS

I. INTRODUCTION

The Maryland Transportation Authority (MdTA) has prepared this report to document its selection of Express Toll Lanes (ETLs) as the management strategy for the Section 100: I-95, 895(N) Split to north of MD 43 project (Section 100 project). This report documents the Authority's analysis of the management strategies considered for the Managed Lanes Alternate and the Authority's reasoning for selecting ETLs with variable or dynamic pricing as the management strategy for Section 100.

II. BACKGROUND

A. Alternates Evaluated in the Environmental Assessment

As required by the National Environmental Policy Act, the Authority and the Federal Highway Administration (FHWA) prepared an Environmental Assessment (EA) for the Section 100 Project. The EA, which was issued in May 2004, evaluated in detail three alternates: the No-Build Alternate, the General Purpose Lanes Alternate, and the Managed Lanes Alternate. Each of these alternates is briefly discussed below:

1. Alternate 1 - No-Build

The No-Build Alternate would be restricted to normal maintenance and safety improvements. There would be no increase in roadway capacity and I-95 would remain four lanes in each direction from the I-895(N) split to approximately the New Forge Road overpass. As a result, LOS would continue to degrade, and the accident rate would not be reduced.

2. Alternate 2 - General Purpose Lanes

The General Purpose Lanes Alternate involves adding general purpose lanes to accommodate the projected traffic demand. This alternate consists of the following lane configurations:

- Four lanes in each direction on I-95 from approximately ¼ mile south of the I-895 interchange to the point where I-95 merges with I-895.
- Six lanes in each direction between the I-895(N) split and MD 43.
- North of MD 43, a transition from six lanes in each direction to the existing four lanes in each direction.

3. Alternate 3 - Managed Lanes

The Managed Lanes Alternate involves two managed lanes in each direction from the I-895(N) split to north of MD 43, plus additional general purpose lanes. The managed lanes would be separated from the general purpose lanes by a physical barrier from the I-95/I-895 interchange to north of MD 43. The Managed Lanes Alternate consists of the following lane configurations:

- Four general purpose lanes in each direction of I-95 from approximately ¼ mile south of the I-895 interchange to the point where I-95 merges with I-895.
- Two managed lanes and four general purpose lanes in each direction between the I-895(N) split and MD 43.
- North of MD 43, a transition from the six-lane section (two-lane managed and four-lane general purpose) in each direction into the existing four general purpose lanes in each direction)

B. Analysis of Management Strategies in the EA

The EA evaluated the Managed Lanes Alternate based on the assumption that this alternative would allow for a range of management strategies on Section 100. Traffic forecasts for this alternate were developed for three scenarios: priced lanes, truck-only lanes and transit-only lanes. These scenarios represented the types of management strategies that could be used on Section 100. The EA did not specify a management strategy for the managed lanes. Instead, the EA stated that the Managed Lanes Alternate would be "designed for flexibility so that management strategies could be modified over time to maximize person-moving capacity, optimize vehicle carrying capacity, and achieve transportation and community goals."

C. The Preferred Alternate Conceptual Mitigation Package

The Preferred Alternate Conceptual Mitigation Package (PACM) identified the Managed Lanes Alternate as the preferred alternate for the Section 100 project. Like the EA, the PACM did not identify the management strategy that would be used for the managed lanes. Thus, the traffic analysis of the Managed Lanes Alternate in the PACM consisted of a range or levels of service based upon the various management strategies.

II. THE AUTHORITY'S SELECTION OF A MANAGEMENT STRATEGY

The Authority has analyzed a range of potential management strategies for the managed lanes on Section 100. This analysis assessed the advantages and disadvantages of the management strategies considered in the EA and PACM. In determining the best management strategy for the Managed Lanes, the Authority

considered the following factors: (1) optimized operational efficiency, (2) safety, (3) congestion management, and (4) revenue production.

Based upon this analysis, the Authority selected the priced management strategy utilizing ETLs with variable or dynamic pricing as the management strategy that it intended to use on the managed lanes. The Authority has consulted with FHWA on its management strategy selection, and has requested that FHWA approve the Managed Lanes Alternate with a priced management strategy utilizing ETLs in its FONSI.

The Authority's analysis supporting this decision is presented below.

III. ANALYSIS OF MANAGEMENT STRATEGIES

The Authority evaluated "Non-Pricing" and "Pricing" management strategies for the Section 100 Managed Lanes Alternate. The Non-Pricing management strategies evaluated included Truck-Only Lanes and Transit-Only Lanes. The Pricing management strategies included Fixed Pricing, Variable Pricing, and Dynamic Pricing.

A. Non-Pricing Management Strategies

Managed lanes could be operated with a variety of different non-pricing methods. These methods could involve separating the operation of the lanes based upon vehicle type (i.e. transit vehicles or trucks) or the person occupancy of the vehicles (i.e. a minimum number of passengers).

During the master plan process, a management strategy consisting of adding one high occupancy vehicle lane (HOV) in each direction to the existing general purpose lanes was considered. An HOV management strategy was found not to be feasible because I-95 already contains high vehicle occupancy on weekends, which would negate the usefulness of HOV lanes. Further, it was determined that it would be difficult and costly to enforce the operation of HOV lanes. The Authority did not consider an HOV management strategy for the Section 100 Project for these same reasons.

1. Truck-Only Lanes

Under this management strategy, only trucks would be permitted to use the managed lanes. Section 100 is a highly traveled truck route. On an average day there are approximately 24,000 trucks on this section, or approximately 15% of the total traffic. In the peak hour peak direction (southbound in the AM peak, northbound in the PM peak) approximately 10% of the vehicles are trucks. For the most part, on this section of I-95 the trucks are defined as heavy trucks (tractor trailers and larger).

The Authority identified the following advantages and disadvantages of selecting a Truck-Only management strategy:

Advantages

- Addresses "just-in-time" delivery needs of many business sectors by improving travel time predictability for commercial vehicles.
- Improves safety by separating heavier vehicles (trucks) from passenger vehicle traffic.
- Overall safety is enhanced in general purpose lanes by reducing the speed differential.
- Allows for visual enforcement of management strategy.

Disadvantages

- Provides inefficient use of managed lane capacity during peak periods. (approximately double the amount of traffic in the peak period, peak direction would be desirable)
- General purpose lanes would operate at LOS F during peak periods.

2. Transit-Only Lanes

One of the major concerns of all transit providers is to have reliable service. Transit-only lanes along I-95 in Section 100 would allow transit providers to be able to accurately determine the amount of travel time needed to traverse this section of roadway without having to be concerned about being in "stop and go" traffic.

Section 100 is in proximity to a major Park and Ride lot located off MD 43 near the White Marsh Mall. This is served primarily by the Maryland Transit Administration (MTA) Bus Route 120. Various other MTA bus routes use I-95 through Section 100, including:

- Route 410 Churchville Bel Air to Baltimore
- Route 411 Hickory Bel Air to Baltimore
- Route 412 Forest Hill / Bel Air to Baltimore
- Route 420 Havre de Grace to White Marsh Park and Ride to Baltimore

There are approximately 40 inbound and outbound buses in the AM and PM peak periods from these five lines. In addition, private firms such as Greyhound and Peter Pan operate intercity buses that use Section 100.

The Authority identified the following advantages and disadvantages of selecting a Transit-Only management strategy:

Advantages

- Increases bus ridership.
- Improves transit service and schedule predictability.
- Allows for visual enforcement of management strategy (i.e., transit vehicles can be easily identified, unlike HOV vehicles).
- Improves safety by separating heavier transit vehicles (buses) from passenger vehicle traffic.

Disadvantages

- Provides inefficient use of managed lane capacity during peak periods. (Approximately 99% of the traffic in the peak direction, peak hour would be in 4 lanes while 1% of the traffic would be in 2 lanes).
- General purpose lanes would operate at LOS F.

B. Pricing Management Strategies

The Authority analyzed multiple pricing management strategies for the Managed Lanes Alternate. The pricing methods that the Authority analyzed included fixed pricing, variable pricing and dynamic pricing. In evaluating these pricing methods, the Authority considered revenue generation, ability to manage congestion, ability to react to changing traffic conditions, impacts on motorists, and other factors, as discussed below.

For the evaluation of each of the pricing methods, the Authority assumed that tolls would be collected electronically. This is consistent with the State's Express Toll Lanes initiative announced by the Maryland Secretary of Transportation in May 2004. Under this initiative, the Secretary has directed the Authority to consider implementing ETLs on several existing facilities, including I-95.

With ETLs, a motorist would not have the option to enter the managed lanes by paying cash. The three toll zones proposed for electronically collecting tolls are (i) north of MD 43, (ii) between MD 43 and I-695, and (iii) between I-695 and I-895. Collecting tolls electronically does not require enlarging the footprint of the facility and therefore would not result in environmental impacts that are different than the impacts of the Managed Lanes Alternate analyzed in the EA.

An overall advantage of a pricing management strategy over a non-pricing strategy is that the pricing strategy generates revenue. The Authority's management strategy analysis did not determine the amount of revenue that each pricing method would generate, as toll rates have not yet been set. Therefore projecting revenue generation was beyond the scope of the Authority's management strategy analysis. The Authority will set the toll rates for the managed lanes following completion of NEPA.

Trucks and buses comprise approximately 10% of the traffic on Section 100. One of the benefits of priced managed lanes is that this management strategy provides transit service providers with consistent travel times. This encourages the use of transit and allows for faster operating times in Section 100. For these reasons it is recommended that transit vehicles be allowed to use the managed lanes at all times of operation. The decision on trucks in the managed lanes is a more complex issue. The Authority has not made a recommendation as to whether trucks will be allowed to use the priced managed lanes.

The pricing methods for the managed lanes that the Authority considered are discussed below.

1. Fixed Pricing

Under the fixed pricing method, vehicles of a similar type would be charged the same fee at all times. The distance traveled on the facility would determine the amount of the fee assessed to each motorist. The toll could be based on a price per-axle basis, and thus the fee could be different for passenger cars versus trucks -- assuming trucks are allowed to use the managed lanes. Fixed pricing is used on other toll roads such as the Pennsylvania Turnpike and the New York State Thruway. Signing would be provided at the various access points identifying the toll rate.

The Authority identified the following advantages and disadvantages of selecting a fixed toll for Section 100:

Advantages

- Simplifies signing for motorists.
- Motorists could easily identify with this method.
- Easiest to operate.

Disadvantages

- Does not respond to traffic conditions.
- Reduces the incentive to use mass transit since consistent transit travel times would be more difficult to attain.
- Does not maximize revenues.
- Will either encourage too many motorists to use the managed lanes in peaks or too few motorists to use the lanes during off peaks.
- If tolls are set too low, similar conditions in the managed and general purpose lanes could occur.

- Would not qualify the facility for the Value Pricing Pilot Program, which is the basis for allowing tolls on I-95 south of MD 43 (this program requires the use of value pricing, which involves varying toll rates to manage congestion).

2. Variable Pricing

Variable pricing allows toll rates to be set based upon identified conditions such as time of day (i.e. peak, shoulder peak hours, mid-day off peak, off peak) or days of the week (i.e. weekdays vs. weekends). Under variable pricing, toll rates would likely be higher in the peak direction during the peak hours (i.e. AM southbound and PM northbound) than during other periods of the week. Toll rates could also take into account vehicle classes and peak driving times, such as summer and holiday weekends.

The Authority identified the following advantages and disadvantages of selecting variable pricing:

Advantages

- Allows for toll rates to react to known conditions.
- Manages the facility by charging the most to drivers who get the largest time advantage.
- Assists in the managed lanes consistently operating at level of service "D" or better.
- Increases revenue generation potential (compared to non-priced strategies).
- Provides for mass transit vehicles to operate on schedule.

Disadvantages

- Toll rates could not adjust quickly to traffic conditions.
- Adjustments will be needed especially at the project initiation to determine an optimum toll rate.
- Motorists will need to become familiar with the variable toll rate especially from the cross road interchanges.
- Signing will be more complex than with a fixed toll.

C. Dynamic Pricing

Dynamic pricing allows the toll rate to adjust quickly – in a predefined number of minutes – as conditions in the general purpose lanes reach an identified level of congestion. This allows for an immediate increase in rates as congestion increases in the general purpose lanes. The dynamic pricing method of ETL management is the most costly initially and to maintain, but offers the opportunity to maximize revenues and maintain LOS D or better in the managed lanes.

Toll rate changes on dynamically priced facilities are accomplished through algorithms that are set up to adjust the toll based on the travel speeds in the general purpose lanes. The slower the speeds in the general purpose lanes, the greater the toll in the managed lanes until the maximum rate is reached. If at any time the managed lanes operate at worse than a level of service "D", toll rates would be adjusted upward to insure free flow speeds in the managed lanes.

The Authority identified the following advantages and disadvantages of selecting dynamic pricing for Section 100:

Advantages

- Allows rates to change in a predefined number of minutes, which allows for an immediate adjustment of rates meaning that motorists who pay the most save the most time.
- Takes into account not only the peak period but the highest volume of the peak hour.
- Potential for greater revenue than fixed or variable pricing.
- Provides for consistent mass transit travel times.
- Can account for holiday and event traffic.

Disadvantages

- Cost to implement and operate is higher than fixed or variable priced strategies.
- Motorists may pay different tolls at the same time on different days making it more difficult to anticipate the toll rate.
- Signing is more complex than with a fixed or variable pricing strategy

V. CONCLUSIONS OF THE ANALYSIS

Based upon the Authority's analysis of priced and non-priced management strategies, the Authority has selected a pricing management strategy rather than a non-pricing strategy. The Authority found that both the truck-only and transit-only lanes during the peak periods would cause the general purpose lanes to operate at level of service 'F'. The two managed lanes would operate at level of service 'A' or 'B,' thereby not effectively using the entire facility. The non-priced management strategies also would not generate revenue and would not be consistent with the State's ETL initiative.

Having selected a pricing management strategy, the Authority determined that electronically tolled priced lanes (i.e. ETLs) with variable or dynamic pricing should be utilized on the managed lanes. Variable or dynamic pricing would allow for more effective use of the facility. The general purpose lanes would operate at a level of service

'E' for the most part while the managed lanes would operate at a level of service 'D' or better. In addition, these pricing methods provide the greatest opportunity to maximize revenue. Finally, variable or dynamic pricing would allow the Authority to provide for more consistent travel times for motorists and transit operators.